

WORK EXPERIENCE

from March 2014

Experiment/Instrument Manager

of 3GM radio science experiment onboard the ESA/JUICE mission to Jupiter:

- Definition and verification of science/instrument requirements
- Instrument radiation analyses and calibration
- Instrument operations definition
- Coordination of team activities
- Writing technical and programmatic reports

Business or sector Project management for space missions

from 2014 to 2015

Project Engineer

"HERO – High performance time & frequency link" - ESA/ESTEC ITT AO17583/13/NL/HB

- Review of scientific requirements for STE-Quest mission
- Definition of microwave links specifications
- Numerical simulations and analysis of E2E experimental performances

Business or sector Space missions

from 2010 to 2014

System Engineer / Post Doc researcher

Sapienza, University of Rome, Radio Science Lab, 18, via Eudossiana, 00084 Rome, Italy

- orbit determination and numerical simulations:
 - propagation of spacecraft trajectories (creation of SPICE/Naif .spk files)
 - orbit prediction and covariance/sensitivity analysis for critical flybys of the ESA/BepiColombo mission to Mercury
 - mission analysis and numerical simulations for a mission proposal to the the Jovian moon Europa
- software development (Python/Shell, FORTRAN):
 - tools for statistical data analysis
 - pipeline for automated data analysis
 - ground station visibility predictions
- architectural design of advanced tracking systems for spacecraft navigation (Doppler, ranging and DDOR)
- error budget analysis:
 - breakdown and statistical assessment of leading noise sources on ESA and NASA tracking systems
 - validation of noise models
 - creation of databases with radio metric and media calibration data

Part of the work funded by ESA/ESOC ITT AO/1-6221/09/F/MOS - "ASTRA - Interdisciplinary study on enhancement of end-to-end accuracy for spacecraft tracking techniques"

Business or sector Spacecraft Communications, Tracking systems and data analysis

from 2009 to 2010

Project Engineer

ESA/ESTEC ITT AO/1-5915/08/NL/AF - Radiocomm signals: "A new way of probing the surface of planets"

- architectural design of a software simulator (Matlab) for mission analysis purposes
- definition of a novel tracking technique (Same Beam Interferometry)
- definition and simulation of innovative mission scenarios (Mars and Moon landers)
- Ka band microwave links specifications and noise modeling
- software debugging and testing

Business or sector Spacecraft communications

from 2006 to 2011 **PhD Student and Research assistant**

Sapienza, University of Rome, Radio Science Lab, 18, via Eudossiana, 00084 Rome, Italy

- orbit determination of the Cassini spacecraft (in collaboration with Cassini FD team):
 - modeling and estimation of non-gravitational accelerations
 - software development for data analysis
 - use of different filtering techniques (batch, sequential and multi-arc)
 - estimation of Titan's gravity field and tidal response
 - numerical simulations and Monte Carlo analysis

Business or sector Orbit determination, Planetary Geodesy and Physics

EDUCATION AND TRAINING

2016 **International School of Space Science: "Planetary Interiors", L'Aquila, Italy (September, 12-16)**

Gran Sasso Science Institute, Viale Francesco Crispi 7, 67100 L'Aquila, Italy

- Observational Background - Methods and Measurements – Instrumentation and Missions

2007-2011 **PhD in Aerospace Engineering - "The non-gravitational accelerations of the Cassini spacecraft and the nature of the Pioneer anomaly"**

Sapienza, University of Rome, 8, via Eudossiana, 00084 Rome, Italy

- Orbit Determination – Data reduction and filtering – Fundamental physics

2010 **ISAEA (International School of Aerospace Engineering Applications) 1st edition: "Estimation Theory", Bertinoro, Italy (July, 12-16)**

- Kalman filtering – Inertial navigation

2006 **MSc in Aerospace Engineering - Thesis: "Pioneer anomaly detectability with planetary probe measurements"**

Sapienza, University of Rome, 8, via Eudossiana, 00084 Rome, Italy

- Application of general perturbative methods (Lagrange/Gauss equations) and special techniques (Encke method) to planetary orbiters - Spacecraft trajectory propagation

PERSONAL SKILLS

Mother tongue(s) Italian

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
French	A1	A2	A2	A1	A2

Portuguese B1 A2 B1 A2 A2

- Communication skills**
- Excellent on composing presentations for engineering and scientific audience
 - Very confident on speaking in public
 - Excellent on technical writing
- Computer skills**
- FORTRAN 77/90 - Matlab - C++ - Shell and Python scripting - Orbit Determination Programs (DPTraj and MONTE, of JPL property) - MS Office - LaTeX - Gnuplot - Spice/NAIF - PHP - MySQL - Unix/Linux - Windows and Mac OS platforms
- Other skills**
- Musician, Martial arts and swimming teacher
- Driving license**
- Car: B Motorbike: A3

ADDITIONAL INFORMATION

- Publications**
- F. De Marchi, G. Di Achille, G. Mitri, P. Cappuccio, I. Di Stefano, M. Di Benedetto, L. Iess, "Observability of Ganymede's gravity anomalies related to surface features by the 3GM experiment onboard ESA's JUpiter ICy moons Explorer (JUICE) mission", *Icarus* 354 (2021) <https://doi.org/10.1016/j.icarus.2020.114003>
 - P. Cappuccio, A. Hickey, D. Durante, **M. Di Benedetto**, L. Iess, F. De Marchi, C. Plainaki, A. Milillo, A. Mura, "Ganymede's gravity, tides and rotational state from JUICE's 3GM experiment simulation", *Planetary and Space Science* 187 (2020) 104902
 - **M. Di Benedetto**, L. Imperi, D. Durante, M. Dougherty, L. Iess, V. Notaro, P. Racioppa, "Augmenting NASA Europa Clipper by a small probe: Europa Tomography Probe (ETP) mission concept, 67th International Astronautical Congress, Guadalajara, Mexico, 26-30 September 2016
 - V. Notaro, **M. Di Benedetto**, G. Colasurdo, D. Durante, P. Gaudenzi, L. Imperi, M. J. Mariani, A. Marotta, G. Palermo, L. Pollice, P. Racioppa, A. Zavoli, L. Iess, "Europa Tomography Probe (ETP) Mission Feasibility – Spacecraft Design", 67th International Astronautical Congress, Guadalajara, Mexico, 26-30 September 2016
 - L. Iess, **M. Di Benedetto**, N. James, M. Mercolino, L. Simone, P. Tortora, "ASTRA: interdisciplinary study for enhancement of the end-to-end accuracy for spacecraft tracking techniques", *Acta Astronautica*, Volume 94, (2014) 699-707
 - L. Iess, **M. Di Benedetto**, M. Marabucci, P. Racioppa, "Improved Doppler tracking systems for deep space navigation", 23rd ISSFD, Oct 29 to Nov 5, 2012, Pasadena
 - S. E. Centuori, F. E. Aleman, **M. Di Benedetto**, L. Iess, A. Graziani, A. Palli, N. Pierdicca, R. P. Cerdeira, P. Racioppa, D. T. Sanchez, P. Tortora, 'RC-SIM: Radiocomm signals for retrieval of planetary geophysical parameters' IAC-11.A3.5.6, 62nd International Astronautical Congress, Cape Town, SA, 3-7 October 2011
 - **M. Di Benedetto**, L. Iess, D. C. Roth, "The non-gravitational accelerations of the Cassini spacecraft", ISSFD 2009, Toulouse
 - N. J. Rappaport, R. Jacobson, L. Iess, P. Racioppa, J.W. Armstrong, S.W. Asmar, D.J. Stevenson, P. Tortora, **M. Di Benedetto**, A. Graziani, R. Meriggiola, "The gravity field of Titan", AGU 2008
 - N. J. Rappaport, L. Iess, J. Wahr, J. I. Lunine, J. W. Armstrong, S. W. Asmar, P. Tortora, **M. Di Benedetto** and P. Racioppa, "Can Cassini detect a subsurface ocean in Titan from gravity measurements?", *Icarus*, Volume 194, Issue 2, April 2008, pp. 711-720
 - N. J. Rappaport, L. Iess, P. Tortora, J. Wahr, J. I. Lunine, R. Mackenzie, J. W. Armstrong, S. W. Asmar, A. Ardito, **M. Di Benedetto** and P. Racioppa, "The Gravity Science Analysis of Cassini Flybys T11 and T22 and Future Work", *EOS Trans. AGU*, 88(52), Fall Meet. Suppl 2007.
 - S. Asmar, N. Rappaport, L. Iess, J. Wahr, J. Lunine, J. W. Armstrong, P. Tortora, **M. Di Benedetto**, P. Racioppa, R. MacKenzie, R. Jacobson: "The search for Titan's ocean", 39 DPS Meeting (AAS), Orlando (FL), 7-12 Oct. 2007
 - L. Iess, J.W. Armstrong, S. W. Asmar, **M. Di Benedetto**, A. Graziani, R. Mackenzie, P. Racioppa, N. Rappaport, P. Tortora, "The Determination of Titan Gravity Field from Doppler Tracking of the Cassini Spacecraft", Proceedings of the XX International Symposium on Space Flight Dynamics (ISSFD), September 24-28, 2007, Annapolis, MD, USA
- Honors and awards**
- NASA Group Achievement award to Cassini Radio Science team for outstanding contributions leading to the success of the Cassini Radio Science investigations at Saturn